51
AMM^N
2850
C.I.A.(6)
57529

SECURITY

THIS DOCUMENT IS THE PROPERTY OF H.B.M. GOVERNMENT, and is issued for the information of officers and responsible officials.

The officer or official in possession of the document will be responsible for its safe custody and that its contents are not disclosed to any unauthorized person.

The document will be kept under lock and key when not in actual use.

Officers commanding units and establishments, &c., are responsible that appropriate circulation is given to this document.

AMMUNITION BULLETIN No. 19.

FOR INSPECTING ORDNANCE OFFICERS

AND

DIVISIONAL AMMUNITION OFFICERS.

(MAY 1941.)

CHIEF INSPECTOR OF ARMAMENTS,
WOOLWICH, S.E.18.

RP 611.

SECURITY.

AMMUNITION BULLETIN NO. 19.

For

INSPECTING ORDNANCE OFFICERS,

And

DIVISIONAL AMMUNITION OFFICERS.

MAY, 1941.

ISSUED BY :-

CHIEF INSPECTOR OF ARMAMENTS,

WOOLWICH.

CONTENTS.

ENEMY AMMUNITION.

FOREIGN AMMUNITION.

244. GRENADE NO.36M - CARE AND PRESERVATION.

Reference Small Arms Training Vol.1, Pamphlet No.13, Lesson 2, Para.2, Sub-para.ii(c) and iii(d).

The omission to remove the grease from the striker in accordance with the instructions given in Sub-para.ii(c) has been found to be the cause of a number of "blinds" and "hang-fires" with this grenade I.O.O.s should ensure that units are aware of the importance of this preparation.

The application of luting to the joint between the fuze and the detonator (vide iii(d)) has been reviewed and it has been decided that the precautions taken in manufacture render this unnecessary unless a gap is found between the detonator and fuze.

245. FUZE, MINE, CONTACT, NO.1 MARK I.

The removal of the filled magazine of this fuze should be regarded as an operation to be carried out under precautions. Should the magazine have to be removed for any reason, it must be unscrewed in the apparatus removing magazines of fuzes. An adapter to be used with the apparatus for this purpose has been approved.

246. CARTRIDGE, M.L., 2-INCH MORTAR, 47 GRAINS, BALLISTITE MARK II.

The Mark II cartridge, which has recently been introduced, differs from the Mark I in having a celluloid cup as a separator between the gunpowder priming and the ballistite instead of a copper tube. The arrangement is similar to that shown in Bulletin No.18, Fig. 64.

247. ROCKET, "U", H.E. 3-INCH, INSERTION OF SHELL.

Attention has been drawn to the fact that difficulty has been experienced in the insertion of the shell into the tail propelling. It has been ascertained that this difficulty arises from displacement of the springs in the shell-ring; such displacements occur when the studs are pressed in and then released; as, for example, by rolling the round on a flat surface. After such pressure the studs may remain pressed in, when displacement of the springs is obvious. Often, however, the studs give the appearance of having returned to their original positions, and the slight displacements of the springs are by no means obvious.

To avoid this difficulty the fingers should be inserted inside the shell-ring and the springs pressed as tightly as possible against the inner wall of the shell-ring. In applying this pressure, the springs should not be moved sideways. Shell must not be screwed into shell-rings from which the springs have been removed.

248. ROCKET, "U" 3-INCH - FOR PRACTICE.

As a temporary measure the tail propelling of rockets for practice may be issued with the following arrangement in place of the socket assembly :-

The bared puffer wire-ends are lead through perforations in a millboard closing disc, fixed 1½-inches from the venturi mouth, and the free wire coiled in the venturi mouth. The disc and perforations are sealed with R.D. Cement or some similar material. This disc bears the caption, "Handle wires with care. Do not pull through disc".

The coiled wires are protected by means of a second disc fixed ½-inch from the first disc and cut away to facilitate removal. This disc is also sealed in position and bears the caption, "Remove this disc for firing. Handle with care".

249. BATCH MARKING, "BV" FOR CARTRIDGES Q.F. 40 M.M.

Remnants of Batches which have been held back at Royal Ordnance Factories for any reason and small quantities in Batches held by Central Ammunition Depots will be grouped in quantities of approximately 2000 rounds. The existing Batch number will be barred out and the marking B.V. (denoting "Batches Various") applied.

This ammunition will be issued to Light A A. Practice Camps and may be repacked at the C.A.D. to make up complete boxes.

250. CARTRIDGE, Q.F. - 75 M.M. WITH A.P. TRACER SHOT, M.61. Fig. 81.

The cartridge case is fitted with a primer percussion M.31 and contains a propellant charge of approximately 2-lbs. of F.N.H. powder.

Shot, A.P. M.61. - The shot is prepared with a cannelure below the driving band for the attachment of the cartridge case. Sealing is effected at this point by the use of N.R.C. compound during assembly. The driving band is of gilding metal. The head of the shell is notched for the attachment of a penetrative cap. A small cavity is formed in the lower part of the shell and it is screwthreaded to receive the base plug. The penetrative cap is of steel, screw threaded to receive the ballistic cap and is secured to the head of the shot by solder and indenting at three points into the notches provided in the shot. The ballistic cap is a die casting of aluminium base alloy, it is screwed on to the penetrative cap and secured by two indentations. The base plug is steel designed with a tracer cavity. The tracer filling consists of 49 grains of "Red Tracer Composition" primed with 20 grains of "Igniter Composition". The filling is arranged to form the usual ignition cavity at the rear. The tracer cavity is closed by a celluloid cap.

The shot is painted or lacquered black and the stencilling as shown in Fig. 81, is in white.

Primer, Percussion, M.31. (Fig. 81).

The primer is of the "push in" type and carries a long magazine. The body is made of brass, half hard, prepared at the inner end to receive the magazine and at the outer end to receive the initiator arrangements, the diaphragm separating the two portions being pierced to form a flash hole. The initiator consists of a brass cup containing 1 grain of "No.70 Primer Mixture" covered by a disc of foiling paper. Housed above this, within the brass cup is the anvil, a saucer shaped brass fitting with two positions cut away to provide flash channels. Positioned below the initiator is the brass striker carried in the striker holder. The magazine is a brass tube approximately 7 inches long and .5 inches in diameter. It is screwthreaded for attachment to the body, and the front end closed by a screwed plug. 24 flash holes are provided, 12 of which are filled with black paint (the remainder may also be filled). The interior is lined with two paper tubes arranged end to end, the front end of the rear paper tube is closed by a boxboard diaphragm and this tube contains 150 grains of "Army Black Powder Grade A.1".

Dimensions and Weights.

Overall length of complete round		26.28 inches.
Weight of complete round		19-lbs. 6-ozs.
Weight of Shot.	approx.	14-lbs. 6-ozs.
Weight of Cartridge Case	"	2-lbs.12-ozs.

Packing.

Each complete round is packed in a cylindrical container. The container consists of three built-up weatherproofed fibre cylinders with end pieces of tinned or terne plate. The length of the container is 27.3-inches the diameter 4-inches and the exterior is painted black.

The U.S.A. nomenclature is "Container Fibre, 75 m.m., M.38 A1"

Three containers are carried in a clamping device consisting of two end plates (shaped to enclose the ends of the three containers) held together by a steel rod enlarged at one end and screwthreaded to receive a butterfly nut at the other end. The rod passes through the end plates and between the containers. Steel bearing washers are provided for each end of the rod, one under the enlarged head and the other under the butterfly nut. This nut is secured by a wire seal. Aluminium plates giving particulars of the Ammunition and information for shipping are secured by the central rod to the end plates. The steel portions of this device are galvanized and painted black.

When assembling containers in this clamping device two are placed with their lids in one direction and the third in the opposite direction.

The overall length of the package is approximately 29-inches and the end dimensions 7.6-inches, the total estimated weight being 70¼-lbs. The cubic displacement is given as 73 cu ft.

The U.S.A. nomenclature for this clamping device is "Bundle, Packing, for 75 m.m. Gun, M.1897, M.1916 and M.1917 Ammunition."

251. ROCKET "U" 3-INCH, TAIL PROPELLING, CARE AND PRESERVATION.

The R.D. Cement seal fixing the closing disc in position at the end of the tail is liable to be rendered ineffective by the warping of the disc. This warping cracks the cement, allowing moisture to enter the tail, and in consequence the rocket may become a "hedge-hopper". Such rockets may travel as little as 200 yards.

The discs of "Ready-Use" rockets will be examined daily and any found to be warped or with the R.D. Cement cracked will be regarded as unserviceable. Such rockets will be set aside and reported to the I.O.O.

Instructions regarding the consequent examination and repair will be issued.

252. FUZE PERCUSSION NO.232 MARK I.

The allocation of the above nomenclature to No.231 fuzes filled non-delay has been approved.

253. CARTRIDGES Q.F. 40 m.m. S.A.P. SHOT MARK I FOIL.

A quantity of this Ammunition has been issued unbatched. In the event of it being necessary to report defects the following particulars should be stated :-

(a) Condition of seals on box (broken or unbroken)

(b) Number of the box.

(c) Propellant Lot No.

(d) Station, month and year of examination as stencilled on the box.

254. GELIGNITE - SERVICE LIFE.

The following report, obtained from C.S.R.D., regarding the "Service Life" of Gelignite is published for information :-

Explosives of this type must be regarded as having a very short life compared with ordinary Service explosives. Deterioration is both chemical and physical, the latter leading to decrease in sensitiveness to detonation. From both aspects the sentencing of gelignite should be as for gelatine dynamites R.A.O.S. Part II, Pamphlet No.10, Section III lays down periodic heat tests and firing proof in this connection. It is considered however that annual firing proof as required by R.A.O.S. for explosives of this type is inadequate, and it is recommended that after one year they should be examined 6-monthly in temperate climates and 3-monthly in warmer climates.

Gelignite would not be expected to fail at heat test under 2 years, but it may be found to give unsatisfactory response to initiation in less than 18 months.

Amendment will be made to R.A.O.S. Part II.

255. SHELL Q.F., H.E. 75 m.m. - METHOD OF FILLING.

The details of filling design No.12113 which has been approved for 75 m.m. Shell are given in the Fig. 82. The smoke boxes used are of the types referred to in Item 261 and the green discs with the letters A or B are stencilled on the shell to indicate the presence and the type of box.

The painting and marking of the shell is in accordance with R.A.O.S. Pamphlet No.3, but weight marking of Mark I Shell will be in accordance with U.S.A. marking.

256. FUZING OF 3-INCH MORTAR BOMBS.

When inserting fuzes No.152 Mark I in bombs not provided with a set screw, or other means of holding the fuze, Composition R.D.1158 will be used instead of luting in order to prevent the unscrewing of the fuze by the action of removing the cap. The partial unscrewing of the fuze in this way before loading may introduce an air gap between the fuze and the exploder which, in the case of the H.E. bomb, would probably prevent complete detonation being obtained.

257. SMALL ARM AMMUNITION. CARTRIDGE S.A. .303-inch H., MARK I.Z.

The use of "Superim" powder as an alternative to ballistite for this cartridge has been approved. The composition of this propellant is similar to that of a cordite and consists mainly of nitrocellulose and nitro-glycerine.

258. PRIMERS, PERCUSSION, Q.F. CARTRIDGE, NO.12 and 18 - USE OF Q.F. CAP COMPOSITION.

The use of Q.F. cap composition has been approved for primers No.12 and 18. For information regarding the identification and reloading of primers containing this composition see Item 144 (Bulletin No.14) and Item 177 (Bulletin No.16).

259. CARTRIDGE Q.F. 4.5-IN. GUN - CORDITES R.D.N./A.Q. AND /F.Q.198-054.

A full charge made up of Cordites R.D.N./A.Q. and R.D.N./F.Q.198-054 for use with projectiles without external tracers has been approved.

260. CARTRIDGES B.L. 9.2-IN. HOWITZER - CORDITE R.D.N./A.Q.

Super charges and 1st to 5th charges made up of Cordite R.D.N./A.Q. S.T.164-048 and 116-036 respectively for use with the 315-lb. streamline shell have been approved.

261. SHELL, H.E. FILLED AMATOL FOR FIELD ARMY GUNS AND HOWITZERS. INCLUSION OF SMOKE BOX FILLED RED PHOSPHORUS. (Fig. 83)

In order to reduce the space occupied by the smoke mixtures in the shell of smaller calibres, thereby increasing the bursting charge, methods of filling designs have been introduced which include a deeper cavity to accommodate a cylindrical smoke box containing red phosphorus in substitution of the larger quantities of smoke mixtures hitherto included with the bursting charge. To simplify filling and the production of components, similar designs have also been introduced for the larger calibres. For shell above 6-inch calibre the substitution of an exploder in place of the smoke box may be authorized if at any time smoke boxes are not available.

Two types of smoke box are provided, the 1½-oz. being made of aluminium and the 1¼-oz. of bakelite. The presence of the smoke box in the shell is denoted by two green discs 1½-inches in diameter painted above the shoulder of the shell diametrically opposite to each other. The type of smoke box is indicated by the letter A or B being stencilled on the green discs. A, indicates aluminium and B, bakelite.

The main variations between the designs for different callibres and the typical design shown in Fig. are the proportions used in the amatol mixtur and the process by which it is filled into the shell. The design numbers stencilled on the shell to facilitate identification are as follows :-

11556	3.7 and 4.5-inch howitzers.
11557	60-pr. gun, 6-inch gun and howitzer.
11558	8 and 9.2-inch howitzers.
11559	9.2-inch gun and 12-inch howitzer.
11561	B.L. 4.5-inch gun (S.L. Shell)
11562	6-inch Howitzer (100-lb. S.L. Shell)
13005	7.2-inch Howitzer.

The letter "A" following these design numbers indicates cold pressed 80/20 Amatol.

262. CHARGE, PROPELLING, M.L. 8-IN. PROJECTOR, MODIFICATION TO ARRANGEMENT.

The existing arrangement of this charge in the six compartments of the container is as follows :-

5 oz. bags of Cordite W.016 in five compartments.

3 oz. and 2 oz. bags of Cordite W.016 in the sixth compartment.

In order to simplify the adjustment of the charge in the field, when the projector is not sited at the standard range, the substitution of another 3 oz. and 2 oz. bag in place of one of the 5 oz. bags has been approved. This arrangement will enable adjustment to be made to the nearest ounce for all weights between 10 ozs. and 30 ozs excepting 29 ozs. A 29 oz. charge is unnecessary as the difference in range with 28 ozs. and 30 ozs. charges is 30 yards only.

The 3 oz. bag introduced by this modification will be red, the same as that in the existing design, and the legend on the container will read "Remove one red bag when firing from projectors with red band".

263. FUZES BASE PERCUSSION NO.159, 270, 346 AND 480.
Fig. 84

These detonating fuzes which are of the "Large" size are all similar in design but differ in the strength of their creep springs, those designed for use in larger calibre shell having weaker springs. The fuzes have a graze action and can be made to function as delay or non-delay fuzes by the setting of a screwed plug fitted in the base cover plate of the shell.

The graze arrangement consists of a fixed needle and a moveable inertia or graze pellet which carries an igniferous detonator. The pellet is held off the needle by a creep spring and by upper and lower centrifugal bolts. The flash channel through the graze pellet is masked by a masking bolt and is designed to form a trap for debris from the detonator which might otherwise obstruct the channel. At the lower end of the graze pellet the flash channel emerges above a circular flange formed on the pellet which in conjunction with a groove in the body forms a seal against flash.

The flash hole in the body below the graze pellet is masked by a ball held in position by a retaining block and spring. This flash hole (a) leads into a cross channel in the lower part of the fuze body. The cross channel (b1 and b in the plan diagram of Fig. 84) contains a delay fitment at one end and is drilled near the other end to accommodate the stem of a copper delay spindle carried in the base of the fuze. A channel containing a perforated pellet of gunpowder (d) leads from each end of the cross channel to the ignition chamber (c).

The ignition chamber is situated below the vertical channel containing C.E. which leads to the C.E. pellet in the magazine of the fuze and comprises a screwed plug with small perforation positioned over a screwed cup containing a perforated pellet of gunpowder. Below the cup there is a copper seal and a closing plug.

The copper gascheck plate which forms part of the base closing arrangement of the shell is prepared with a small pocket which fits into the recess in the base of the fuze containing the delay spindle with its pressure plate. The base cover plate of the shell when designed for this type of fuze is fitted with a setting plug by means of which gas pressure from the propellant can be excluded from or admitted to the pocket in the gascheck plate positioned in the pressure plate recess. The setting plug is of steel and is screwthreaded for insertion in the base cover plate. The inner face of the plug is shaped to form an effective seal in conjunction with the pocket in the gascheck plate when screwed fully home. The outer face is prepared to receive key No.88 by means of which it is set i.e. screwed fully home or unscrewed to the extent permitted by the stop screw. Two arrow heads, one marked "D" and the other "ND" are engraved on this face indicating the direction in which the plug must be turned to, obtain delay or non-delay action. The base cover plate has a number of perforations arranged to form a ring which admit gas pressure to a corresponding ring shaped groove on the inner face of the plate. This ring shaped groove permits the pressure to pass in the direction of the setting plug.

Action.

The optional delay or non-delay action is only obtainable when the shell is fitted with a base cover plate containing a setting plug. The setting plug is left unpainted and its presence in the base cover plate, which is painted red, is readily verified. With the older types of base cover plates, gas pressure is not excluded from the delay spindle and the fuze will always give the delay action. In these circumstances the base cover plate is painted blue.

Delay.

The setting plug is unscrewed as far as the stop screw will permit by turning it in the direction indicated by the "D" arrow. On acceleration the graze pellet, masking bolt and sealing ball set back, thus preventing the flash from the detonator reaching the magazine should the detonator fire

prematurely. At the same time the detent sets back, compressing its spring and is prevented from rising by its stem fouling the shoulder of the spring recess. As the shell moves up the bore, the pressure of the propellant gases is admitted through the perforation of the base cover plate to the pocket in the gascheck plate. This pressure is exerted on the pressure plate of the delay spindle and forces the spindle to move into the fuze closing the cross channel at this side. Whilst in flight the upper and lower centrifugal bolts, the masking bolt and the sealing ball with its retaining bolt are moved outwards by centrifugal force. The graze pellet with its detonator is now held off the needle by the creep spring only and the fuze is fully armed. On graze, the graze pellet overcomes the creep spring by its momentum and carries the detonator onto the needle. The coned front end of the graze pellet jams tightly in the narrowing entrance of the needle cap and prevents the pellet rebounding. The flash from the detonator passes through the flash channel of the pellet to the cross channel in the lower part of the fuze (a). The flash then passes through the open side of the cross channel (b) to the delay fitment (e) and the perforated powder pellet (d) and ignites the power filled in the ignition chamber. The pressure and heat from the explosive of this powder pellet passing through the small hole in the screwed plug brings about the detonation of the C.E. in the vertical channel and the C.E. pellet in the magazine.

Non-Delay.

The setting plug is screwed home as far as possible by turning it in the direction indicated by the "ND" arrow. With the plug in this position the propellant gas is prevented from entering the pocket in the gascheck and exerting pressure on the delay spindle. On graze the flash from the detenator reaches the igniter chamber by passing over the head of the delay spindle in the cross channel (b1) thus avoiding the delaying action of the delay fitment.

264. CARTRIDGE S.B., H.E. 3-INCH.
Fig.85

The complete round for this smooth bore equipment consists of an H.E. shell with an "always" fuze similar to that in the No.69 Grenade and a propelling charge carried in a tinned plate container attached to the base of the shell. The propellant container is fitted with a shortened .303-inch cartridge case with cap as the means of ignition and the front portion of the container also performs the gas sealing function of a driving band. The lower part of the bakelised paper tube in the shell contains a distance piece of wood leaving the upper part clear to receive the detonator. A bakelite tube with the lower part solid may be used as an alternative.

Marking.

The rounds are marked in accordance with R.A.O.S. Part II, Pamphlet No.3 and are batched.

Packing.

Five rounds, each in rolled paper container No.14 are packed in Box C.259, the stowage dimensions of which are 21¾ x 11½ x 5¾ inches, and the filled weight, approximately 60 lbs.

Storage Classification.

The H.E. round is classified as Group 8, Category "Z".

265. GRENADE, HAND, ANTI-TANK NO.73 MARK I.

The grenade consists of a cylindrical tin body with folded side seam and has a 3-lbs. 4-oz. bursting charge of Polar, Ammon, Gelatine, Dynamite. The lid which is fitted with an "Always" fuze similar to that used with the No.69 hand grenade (Bulletin No.17, Item 200) has to be removed to insert the detonator when preparing the grenade for use. To enable this to be done rapidly the means of attachment between the lid and body consists of an interrupted thread, the lid being secured and the joint sealed against the entry of moisture by a strip of adhesive tape.

The letters P.A.G.D. stencilled on the buff coloured body of the grenade indicate the nature of the bursting charge.

The composition of Polar, Ammon, Gelatine, Dynamite is as follows:-

	Per Cent.
Nitro glycerine	50
Nitro cotton	2
Ammonium nitrate	40
Wood meal	6
Moisture	2
	100

Packing.

10 grenades are packed in Box B.166 Mark II with a cylinder containing 10 detonators.

B.166 Mark II is a steel box with a filled weight of approximately 62-lbs. and has the following stowage dimensions :-

19.7 x 9 x 13.2 inches.

Note.

Failures with this grenade have been caused by the jumping of the interrupted threads when the lid is replaced after the insertion of the detonator and the lid being subsequently forced off the grenade when thrown. To avoid this possibility the strip of adhesive tape should be fixed round the threads of the body when the lid is removed and the lid screwed down over it. Should the single strip of adhesive tape be insufficient in bad cases to provide a secure attachment of the lid the strip should be duplicated or reinforced with strips of paper, etc. or cleaning flannelette.

Action has been taken to remedy the cause of this defect.

266. ROCKET "U" 3-INCH, TAIL PROPELLING.

Reference Bulletin No.17, Item 193, the following details of the tail propelling are published for information :-

(Fig. 86).

The steel body is approximately 55-inches in length and 3-inch in diameter. Near the head end there are eight holes to receive the locking pins while near the tail end are slots for the attachment of the four tail fins. These slots are sealed by luting. The interior of the body is coated with refractory cement and the exterior is "Parkerized" or "Bonderized".

The shell ring, carried in the head end of the body, is threaded to receive the shell and has eight holes corresponding with those in the body. The locking pins with flanges on their inner ends are inserted through corresponding holes of the ring and body and retained in position by steel springs in circular strip form positioned inside the shell ring.

The copper or cadmium plated steel obturator in rear of the shell ring is sealed with R.D.Cement and has a glazedboard disc with two millboard washers interposed between it and the propellant charge.

The propellant charge consists of a 12-lb. 11-oz. tube of cordite S.C. with castellations formed at the head end and a washer of dummy cordite attached at the tail end which bears against the ring of the grid. Spacing discs and tabs are attached to the exterior of the cordite tube by a special cement.

The igniter assembly consists of a 10 gram charge of a magnesium composition with an electric fuze enclosed in a paper tube. The tube is treated with Shellac and R.D.1155, and is positioned in the castellations in the head of the cordite tube, the insulated leads of the electric fuze being lead through the cordite tube to the contacts at the tail end of the body.

The malleable iron grid is in the form of ring with four enlarged portions and on its head side a ring is formed to support the propellant charge.

The tail obturator, positioned between the grid and the venturi tube is of steel and made in the form of a cup with a central perforation.

The steel venturi tube is attached at the tail end by screws and welding and contains a shalloon bag of silica gel inserted, choke leading, into the coned interior and retained by a glazedboard cup. The glazedboard cup has a portion cut away to give clearance for the insulated leads of the electric fuze and is inserted with R.D. Cement.

The two leads are each connected to a contact at the tail end of the body. These two contacts are connected to a second contact, diametrically opposite in each case, by short insulated leads. The four contact devices are insulated from the body.

The closing disc of paper or bakelite is shaped to clear the contacts at the tail end of the body and is sealed with R.D. Cement.

267. FUZE TIME NO.700, MARK I.
Fig. 87.

This powder filled fuze, used with the H.E. shell of the 3-inch "U" Rocket, is a combustion fuze of the tension type and has a time of burning of approximately 22 seconds.

The brass time rings which are filled with S.R.227 are generally similar to those of other combustion time fuzes.

The body which is also of brass is graduated and numbered from 0 to 30, the numbered graduations being further sub-divided by divisions of .25. A flash producing cap of the type used in the 28 bore cartridge is carried in a recess in the top of the body from which a flash channel leads to the upper time ring. The cap is protected from the striker, when the lower ring is set at "Safe", by the safety lever which is pivotted in a recess in the body. A channel leading from the top of the body to a position near the graduations is provided for the escape of air pressure.

The safety lever is a short steel shaft with the upper portion at an angle to pass between the striker and cap. Near the lower end flats are formed for the attachment of a spring loaded steel catch the outer end of which fits into a recess on the inside of the lower time ring when the fuze is set at "Safe".

A turning movement is imparted to the safety lever when the outer end of the catch leaves the recess in the lower ring. This clears the upper portion of the safety lever from the path of the striker.

The time mechanism is housed in the brass cap of the fuze and consists of a striker with a collar formed near its head which forms a bearing for one end of a spiral spring. The spring is enclosed in an aluminium alloy casing known as the plunger. This plunger is perforated at the top for the striker stem and its diameter increases in steps towards its lower end which is a close fit in the brass cap and is open. Coopers Grease No.4 is used between the brass cap and the enlarged lower part of the plunger to keep out moisture and as a lubricant. The striker is supported at its collar by two brass pawls which also support the plunger.

The brass pawls are pivotted on the pawl housing which is a brass fitting screwed into the underside of the brass cap.

The brass cap has a flat top with five perforations. The centre perforation leads to the striker recess and the remaining four lead to the recess accommodating the plunger.

Action.

When the lower ring is moved from "Safe" for setting the safety lever is rotated clear of the striker path.

On acceleration, air enters the perforations in the top of the cap and the pressure which builds up inside causes the plunger to move down over the striker. The lower edge of plunger bearing on the outer ends of the pawls causes the inner ends to lift the striker. The striker spring is thus compressed between the collar on the striker and the top of the plunger. This movement continues until the inner ends of the pawls are rotated clear of the striker collar. The striker is then driven onto the cap by its spring and the subsequent action is similar to that of other combustion time fuzes.

The fuze is prepared for the use of the No.119 fixing key and the No.120 Setting Key.

Details of care and preservation and also of packing are given in Bulletin No.17, Item 193.

268. Station Monograms.

Reference Magazine Regulations, Part I, 1934, Appendix III. The following additions are notified :-

Cherrier	Cr/C	Canada.
Bouchard	Bo/C	
Pickering	Pg/C	
Scarboro	Sc/C	

269. FUZES.

The following table, (in substitution for that given in Bulletin No.16, Item 175 and cancelled in Bulletin No.18, Item 240) summarises the fuzes which may be met with in the various nature of shell of different calibres. In many instances the fuzes shown are restricted to a certain method of filling or mark of shell of the calibre. The inclusion of this detailed information in tabulated form would result in a complicated table and has not been done. For further details reference should be made to the handbook of the equipment in question.

Fuzes for practice ammunition are not included.

Equipment	H.E.	Shrap.	Smoke		Chem.		Star	Other natures
			B.E.	Burst	B.E.	Burst		
B.L.								
4.5-in. Gun.	117,119,210, 222.							
60-pr. Gun.	101E,106E, 117,119	88						
5.5-in. Gun.	119,210,222, 231.				221			
6-in. Gun (Field)	101B,106E, 117,119,210, 222,231.	88						
6-in. Gun (Coast)	13,18,45, 45P,230.	88						CPBC/480 APC./16,480
6-in. How.	101E,106E, 117,119,210, 222,231.			106E	221	106E	183 188	
8-in. How.	101B,106E, 119,210,222, 231.							
9.2-in. Gun. (Field)	117,119,210, 222,231.	88						
9.2-in. Gun. (Coast)	13,45,45P, 117,119.	88						APC/16,346
9.2-in. How.	101B,106E, 119,231							CP/16
12-in. How.	101B,106E,117, 119,231.							
14-in. Gun	44,106E.							
15-in. Gun.								APC/159
18-in. How.	101B,106E, 231.							CPBC/270 CP/16

Equipment	H.E.	Shrap.	Smoke B.E.	Smoke Burst	Chem. B.E.	Chem. Burst	Star	Other natures
Q.F.								
2-pr. A/Tk. Gun.								AP / 281
2-pr. A.A. Gun	243							
40 m.m. Gun.	250, 251.							
3-pr. 2-cwt. Gun.								AP / 280
6-pr. 6-cwt. Gun.								CP / Hotchkiss
6-pr. 10-cwt. Gun	44, 242, 244							
12-pr. 12-cwt Gun.	18, 44, 45, 45P.							
3-in. How.	117, 119.							
3-in. 20-cwt. Gun.	80/44, 199	80/44 199						
18-pr. Gun.	106E, 115E/ 117, 119, 210, 222.	80 80B.		106, 106E, 115E, 117, 119.				
25-pr. Gun.	117, 119, 210, 222.		220 221		221	117		
3.7-in. How.	101E, 106E, 222.	80 80B	83	106E			183	
3.7-in. Gun.	199, 207, 208.	199 207 208						
4.5-in. How.	101E, 106E, 117, 119.		83	44, 106E, 117, 119.			183	
4.5-in. Gun.	207, 208, 209, 230P.	199 209					198	SAP / 501
4.7-in. Gun.	13, 18, 45, 45P.	88						S A P / 12F. Spl, 500 and 501.
MORTARS.								
2-in. Mortar	151, 151A.							
3-in. Mortar.	138, 150, 152, 152A.			138, 139, 150, 152, 152A.		138		
3.7-in. Mortar.	106E, 119, 231			106E.		106E.		

NOTE:- Wherever Fuze 117 is quoted Fuze 117C may be used.

ENEMY AMMUNITION.

270. GERMAN 2 KG. ANTI-PERSONNEL AIRCRAFT BOMB ("BUTTERFLY BOMB")

Fig. 88.

This H.E. bomb, fitted with a mechanical fuze which has an alternative time or percussion action, makes use of a hinged outer casing to arm the fuze during its fall. The time action of the fuze is not variable so that when the time of arming and running exceeds the time of flight the effect of a delay fuze is produced, i.e. a short period will elapse after impact before detonation occurs.

The bomb body is a cast iron cylinder (D) 3 inches in diameter and 3.1 inches long, the average wall thickness being about $\frac{3}{8}$-inch. A screw threaded fuze hole is provided in the side of the body. The interior is coated with a bitumen composition and contains a bursting charge consisting of $7\frac{1}{2}$-ozs of cast T.N.T. topped with the bitumen composition and designed to form an exploder cavity.

The outer casing is of steel and encloses the bomb. The casing consists of two half cylinders connected by hinging at one side and by a securing pin passing through two lugs on the other side. Carried at each end of the hinge bar is a hinged disc. These discs form the end pieces of the cylindrical casing and are positioned by internal flanges formed at the ends of the half cylinders. The hinges of the discs are inclined in such a way that the discs in the open position are set at a pitch similar to that of an arming vane. Springs are fitted to the discs and half cylinders which cause them to open on their hinges when the safety pin is removed. The outer casing is connected to the head of the safety bolt of the fuze (C) by a short length of steel cable (B). The cable is fitted with a steel head (A) for attachment to the outer dasing.

Fuze (Fig. 89)

The fuze consists of three main parts, the cap (E), the body (F) and the base ring (K). The cap and body appear to be made of diecast alloy - probably zinc base - and the base ring of aluminium alloy. The three portions are bolted together by 3 bolts.

The cap, which is cylindrical, is fixed to the upper side of the body and is screw-threaded for insertion into the bomb. On the underside it is recessed to house the mechanical portions fitted on the body and a central hole at the top is provided with a screw-threaded bush to receive the safety bolt. On the upper side of the cap a setting plug (8) is provided by means of which percussion or time action can be arranged. The cap is engraved with two index lines, one marked "AZ" (Aufschlag Zunder, i.e. impact fuze)with which the slot in the setting plug is aligned for percussion action and the other marked "ZEIT" (Time) which is the setting mark for time action Beneath the setting plug is positioned a small pin (9) which is moved in towards the body when the plug is set to "ZEIT" and withdrawn when set to "AZ".

The safety bolt is connected at its outer end to the connecting cable of the outer casing. The bolt is provided with a double thread for a portion of its length to engage the bush in the cap and is provided with a collar at its inner end which limits the extent to which the bolt can be withdrawn. When screwed home the safety bolt prevents the operation of the clockwork mechanism and masks the detonator (6) from the striker (5).

The body, which is also cylindrical in shape, carries the striker and detonator assemblies in a lateral channel (3). Communicating with this channel is a vertical channel in the centre of the body to receive the safety bolt and a small vertical channel (7) adjacent to the detonator which leads to the gaine. A semi-circular recess is formed in one side of the lateral channel to house the retaining shaft (2).

The striker assembly consists of a spiral spring (which also provides the motive power for the clockwork mechanism) held under compression between an outer sleeve screwthreaded for assembly in the body and an inner sleeve which carries the needle. The striker is retained with its spring under compression by the retaining shaft. The portion of the shaft which engages the striker sleeve is semi-circular in cross section whilst the upper end has flats formed on it for the attachment of the time lever (1). The outer end of the lever is in the form of a toothed segment which is enmeshed with the clockwork escapement housed in a recess in the body. A portion of the lever is cut away to accommodate the safety bolt. The lever is also shaped to engage a projection (11A) on the impact arm (11). The impact arm is pivotted on the cylindrical portion of the retaining shaft below the time lever. The strip spring (12) bearing on an extension of the arm tends to make it rotate around the retaining shaft in a clockwise direction. This rotary movement of the arm is prevented by the projection (10A) on a spring loaded detent (10) housed in a recess in the body.

The base ring is screwthreaded internally to receive the gaine which is of bakelite and encloses a container of similar design to that of the H.E. unit fitted to some of the German 1 Kg. incendiary bomb.

ACTION.

When the securing pin of the outer casing is withdrawn the hinged half cylinders and end pieces of the casing are forced to the open position by their springs. The half cylinders acting as a drogue in the air stream of the falling bomb causes the connecting cable to taughten and the end pieces, rotating as the result of their pitch, transmits this turning movement to the safety bolt by means of the connecting cable. After three revolutions the safety bolt is unscrewed sufficiently to unmask the striker channel and a further three revolutions removes it from the path of the time lever. The collar on the lower end of the safety bolt prevents the bolt being entirely withdrawn from the fuze cap. The subsequent action of the fuze depends upon the position of the setting plug.

(a) Set to "AZ" (Percussion Action)

On the withdrawal of the safety bolt from contact with the time lever the striker under the motive power of its spring imparts a turning movement to the retaining shaft. The time lever, being rigidly attached to the retaining shaft, turns with the shaft in a clockwise direction under the control of the clockwork escapement. The impact arm, not being rigidly fixed to the retaining shaft is held stationary by the projection on the detent. The rotation of the retaining shaft and time lever continues until the time lever is obstructed by the projection at the end of the impact arm. With the retaining shaft rotated to this position the curved surface of the shaft is almost clear of the striker channel. On impact the detent with its projection sets down releasing the impact arm which is then rotated by the action of the strip spring. This movement of the impact arm enables the time lever and retaining shaft to continue the turning movement and free the striker which is then driven onto the detonator. This action on impact is practically instantaneous.

(b) Set to ZEIT (Time Action)

The action of turning the setting plug to "ZEIT" causes the small pin beneath it to move downwards and depress the spring loaded detent thus removing the projection on the detent from the path of the impact arms. Under the impulse of the strip spring the impact arm is rotated clear of the path of the time lever. The subsequent action is then as described in (a) except that the time lever is not obstructed by the projection on the impact arm and completes its rotary movement with the retaining shaft. The striker is thus released and driven onto the detonator. The time which elapses between the withdrawal of the safety bolt and the firing of the detonator has been found to vary between 2 and 5 seconds with different fuzes.

The flash from the detonator passes to the initiator in the gaine by the flash channel (7) and brings about the detonation of the bursting charge by means of the P.E.T.N./Wax filling of the gaine.

Marking.

The outer casing is painted field grey.

271. ITALIAN 4.5 Kg. MANZOLINI H.E. AIRCRAFT BOMB.
(Figs.90 and 91).

This bomb, an invention of Commandatore Manzolini, is also known as the "Thermos" bomb because of its resemblance in appearance to a thermos flask. It is an H.E. bomb fitted with a fuze which becomes fully armed after impact and subsequently initiates the detonation of the bomb when disturbed by handling etc.

The body of the bomb is constructed of $\frac{3}{8}$-inch seamless mild steel tube $2\frac{1}{2}$-inches in diameter and 7-inches long, prepared at the tail end to receive the fuze and closed at the other end by a steel disc which is welded in position. The bursting charge consists of approximately 2-lbs. of T.N.T. The body is painted brown and the overall length (with fuze) is 14 inches.

The fuze consists of a striker spring (1) held under compression between two cup shaped containers, one fitting over each end of the spring. The cup fitted over the tail end of the spring (2) carries a piston and is prevented from rising by three balls (3), located in the walls of the liquid cylinder (4), which bear on a shoulder formed on the cup. The cup fitted over the other end of the striker spring (5) carries the striker and is prevented from moving out of the liquid cylinder by three pairs of steel balls (6) also located in the wall of the liquid cylinder and bearing on a shoulder formed on the cup.

The liquid cylinder is of brass and is closed at the tail end by a screwed plug (7). A circumferential flange is formed externally about its centre to limit its downward movement within the front cup (8). Above and also below this flange the cylinder is prepared to house two sets of three steel balls. The upper set prevents the piston cup from rising and the three balls are retained in position by an inertia sleeve (10). The three steel balls below the flange (11) are retained by the piston cup and the open end of the front cup (12). Whilst these balls are in this position further movement of the liquid cylinder into the front cup is prevented. Near the front end the liquid cylinder has a circumferential groove (13) which in combination with a screw carried in the front cup limits the axial movement of the cylinder. Below this groove the cylinder is prepared to house three pairs of steel balls which support the striker cup. At the front end the cylinder is recessed to accommodate a weak spiral spring (14). Internally the cylinder is designed to form an oil chamber for the piston and a circumferential flange is formed to position the piston and striker cups.

The front cup which receives the forward end of the liquid cylinder is of brass and carries a small detonator (15) positioned over a flashhole leading to larger detonator (16) which is carried in the body of the fuze and is in contact with the bursting charge. The cup has an internal circumferential groove (17) to receive the steel balls supporting the striker cup when the fuze is fired.

The tail cup (18) which fits over the tail end of the liquid cylinder is of brass and encloses a strong spiral spring (19) held under compression between the tail end of the liquid cylinder and the closing plug of the tail cup (20).

The body of the fuze (21) is screwthreaded for insertion in the bomb and is fitted with a hollow steel cylinder (22) within which the liquid cylinder assembled with its front and tail cups etc. is held by means of two loose tubular positioning pieces, one above the tail cup (23) and the other below the front cup (24). Three holes are provided in the wall of this body cylinder, near its centre, to receive the claws (25), fitted to spring strips to support the inertia sleeve of the liquid cylinder. The body cylinder is closed at the tail end by a brass screwed plug which is prepared to receive the screwthreaded shaft of the arming vanes and is flanged to support one end of the arming spring (26). The arming sleeve (27) is a short blackened cylinder with rubber insert which fits over the body cylinder and is positioned between the arming spring and the claws with three distance pieces (28). The distance pieces and the three spring strips carrying the claws are retained in the engaged position by an aluminium tail cap (29) which is secured over the tail of the fuze by the arming vanes. Projecting louvre-like fins (30) are formed in the end of the tail cap.

The arming vanes are of aluminium, one of the vanes being prepared to receive a safety pin which when in position prevents rotation of the vanes.

Action.

Before release the safety pin is removed from the arming vanes thus allowing the vanes to be rotated by air resistance during the descent of the bomb. The rotation of the arming vanes unscrews the shaft of the vanes from the brass cap of the body cylinder and releases the aluminium tail cap which is then removed from the fuze by the spring strips carrying the claws and the action of the air against the fins of the tail cap. The removal of the tail cap permits the claw spring strips and the distance pieces to fall away and the arming sleeve is moved by its spring to seal the claw holes in the body cylinder. This movement of the arming sleeve assists in the withdrawal of the claws and the removal of the tail cap. The withdrawal of the claws removes the support between the inertia ring and the external flange on the liquid cylinder and leaves the ring supported by a small projecting ring formed on the cylinder.

On impact the tail cup sets down over the liquid cylinder compressing its spring and driving the inertia ring down onto the external flange of the liquid cylinder. This movement brings the groove on the inside of the inertia sleeve in line with the steel balls in the wall of the liquid cylinder which retain the piston cup of the spring. These balls enter the groove and allow the piston to rise under the force of the spring and against the resistance offered by the oil flowing through the clearance between the piston and the cylinder wall. The upward movement of the piston removes the support of the piston cup from the steel balls located in wall of the liquid cylinder below the flange and permits the balls to enter the cylinder, thus removing the means of preventing the liquid cylinder from further entry into the front cup. This further entry is now opposed by the weak spiral spring below the liquid cylinder and the fuze is fully armed.

On being subjected to a sudden movement or jarring action the opposition of the ring is overcome by the movement of the liquid cylinder into the front cup or that of the front cup over the liquid cylinder, according to the direction from which the distributing force is applied. Either of these movements brings the groove inside the front cup in line with the three pairs of steel balls located near the front end of the liquid cylinder which support the striker cup. The balls enter the groove and the striker is driven by its spring onto the initiating detonator and the detonation of the bursting charge is brought about through the main detonator with which it is in contact.

From the drawings available the fuze appears to be designed to function also on the "always" principle when the disturbing force is applied laterally. In these circumstances a sudden movement or jarring action would cause the liquid cylinder to reach the armed position within the front cup as the result of the closing movement of both of these components. The movement of the liquid cylinder would be brought about by the convex surface of the closing plug of the tail cup moving down the concave underside of the closing plug of the body cylinder and transmitting the movement to the liquid cylinder through the intervening spring. Corresponding movement of the front cup, in the opposite direction, would be brought about by the incline on the front end of the front cup moving down the corresponding incline in the fuze body. In each case the inclined sides of the grooves accommodating the tubular position pieces appear to facilitate these movements.

The sensitivity of the fuze is dependent on the strength of the spiral spring in the front cup. The existence of a green bomb of this type fitted with a more sensitive fuze has been reported.

FOREIGN AMMUNITION.

272. CARTRIDGES, S.A. A.P. & A.P. TRACER 13.2 M.M. (FRENCH)

The general details of this ammunition which is of American design are as follows :-

1. Armour Piercing (Fig.92)

(a) Cartridge Case.

The brass case is of the rimless type and is necked. One flashhole leads from the cap chamber to the interior and the anvil used is of the floating type.

(b) Propellant.

The charge consists 15.12 grammes of N.C. powder in the form of graphited tubular grains of irregular size. The composition of the propellant is :-

Nitrocellulose (13.1% nitrogen)
Diphenylamine
Graphite
Tin
Volatile Matter.
Camphor

(c) Cap

The cap contains an initiator composition consisting of mercury fulminate, potassium chlorate and antimony sulphide covered with a metal foil which is treated with a red varnish. Externally the cap is varnished with a red transparent varnish.

(d) Bullet.

The bullet is boat tailed and consists of a gilding metal envelope enclosing a lead tip and a hard steel core. The parallel portion of the hard steel core is relieved to allow the collapse of the envelope on firing and thus form forward and rear engraving surfaces, which may reduce barrel wear.

(e) Dimensions and Markings.

Overall length of round	5.37 inches.
Weight of bullet	51.1 grammes.
Total weight of round	120.2 grammes.

The stampings on the base of the cartridge case are shown in Fig. 92.

2. Armour Piercing, Tracer. (Fig.93)

(a) The cartridge case, propellant and cap are the same as those described in 1(a), (b) and (c) except that the cap is varnished externally with yellow varnish and the metal foil is treated with blue varnish.

(b) Bullet.

The bullet is boat tailed and consists of a gilding metal envelope enclosing a lead tip and hard steel core. Part of the parallel portion of the envelope is machined away to form forward and rear engraving surfaces. A tracer cavity, formed in the hard steel core and partially closed by a brass washer, contains a tracing composition consisting of strontium nitrate, strontium peroxide, magnesium and resin primed with a composition consisting of potassium nitrate, charcoal, sulphur and resin.

(c) Dimensions and Markings.

Overall length of round	5.38 inches
Weight of bullet (empty)	49.6 grammes
Total weight of round	119.6 grammes.

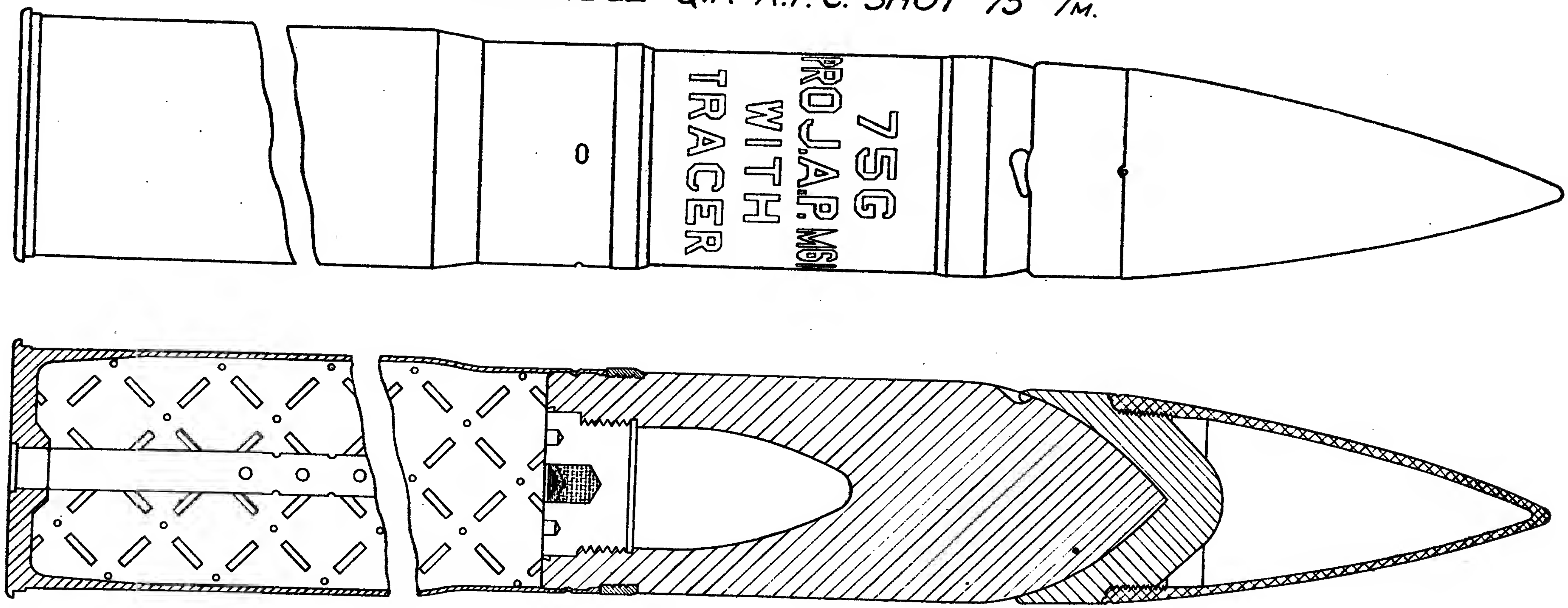
The bullet has a black tip. The markings stamped in the base of the cartridge case are shown in Fig.93.

273. STAR SHELL 138 M.M. (FRENCH) (Fig.94).

The shell is generally similar in construction to service star shell, the main difference being the greater space between the cavity in the head of the shell (which is screwed to the body) and the burster cavity. This space is bridged by a steel flash tube, 4 inches long, which is screwed into the cap covering the burster cavity. The upper end of the tube is enlarged and is situated beneath the fuze. The opening charge consists of 50 grammes (770 grains) of fine grained gunpowder contained in a cylindrical bag of cotton drill. The baffle plate is provided with 5 flash holes. The star container is not fitted with a rolled paper liner but the interior is varnished. The star composition consists of barium nitrate, potassium nitrate, magnesium metal, magnesium compounds and boiled oil. This composition is primed with a mixture consisting of potassium nitrate, sulphur, charcoal and magnesium which is prepared for ignition by the inclusion of 4 pellets of gunpowder with quickmatch. The star container is closed at the mouth by a perforated thin steel disc. The disc is secured by a slight turning over of the mouth of the container. When ignited at rest the composition burns for 88 seconds with a greenish white flame of 125,000 candles intensity. The parachute has a diameter of 32 inches and has the usual vent. The base plate of the shell is merely hammered into position, no shearing pins being used although an anti-twisting pin is present.

The shell is fitted with two driving bands and weighs 66½-lb. The body of the shell is painted white and marked with three stars around the shoulder. The letters OBUS E.T.230 are stencilled on the head and 2403 N 2282 BV stamped between the driving bands.

FIG. 81.
CARTRIDGE Q.F. A.P.C. SHOT 75 M/M.



PRIMER PERCUSSION M.31.

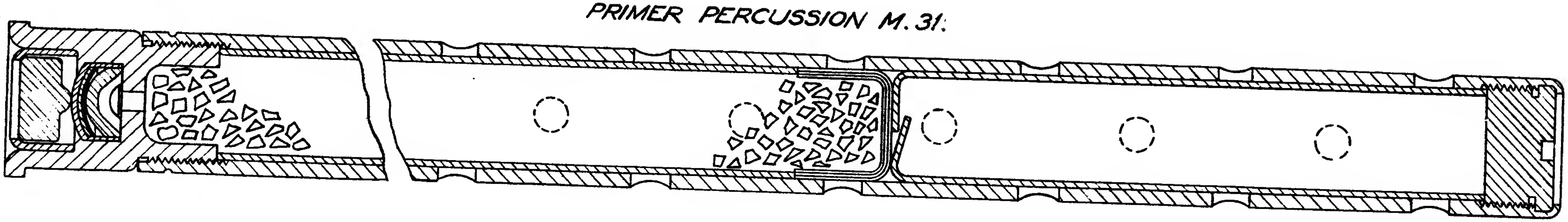


FIG. 82.

SHELL Q.F. H.E. 75 M/M.
(M.O.F. 12113).

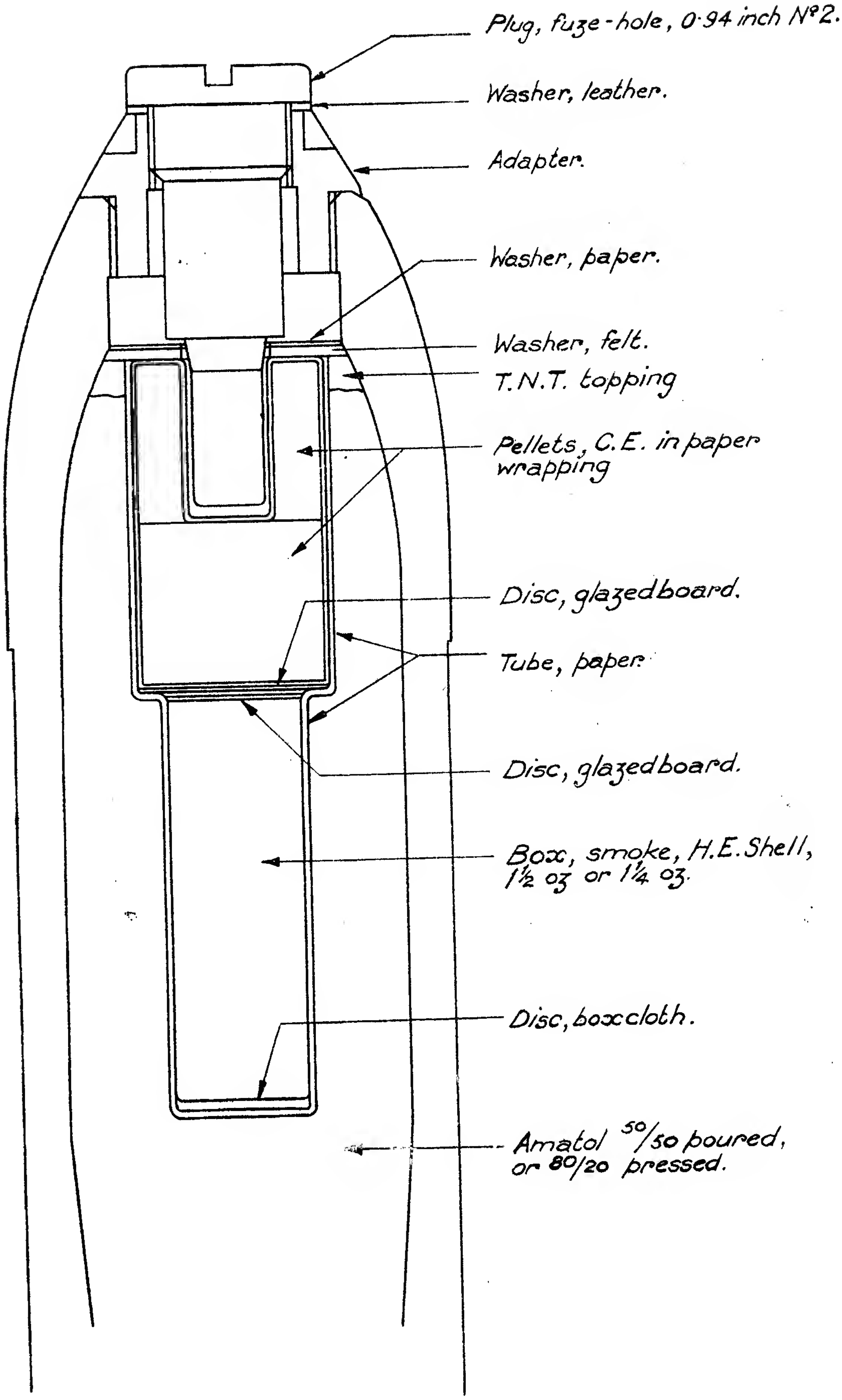


FIG. 83.

SHELL H.E. (AMATOL) FIELD ARMY.

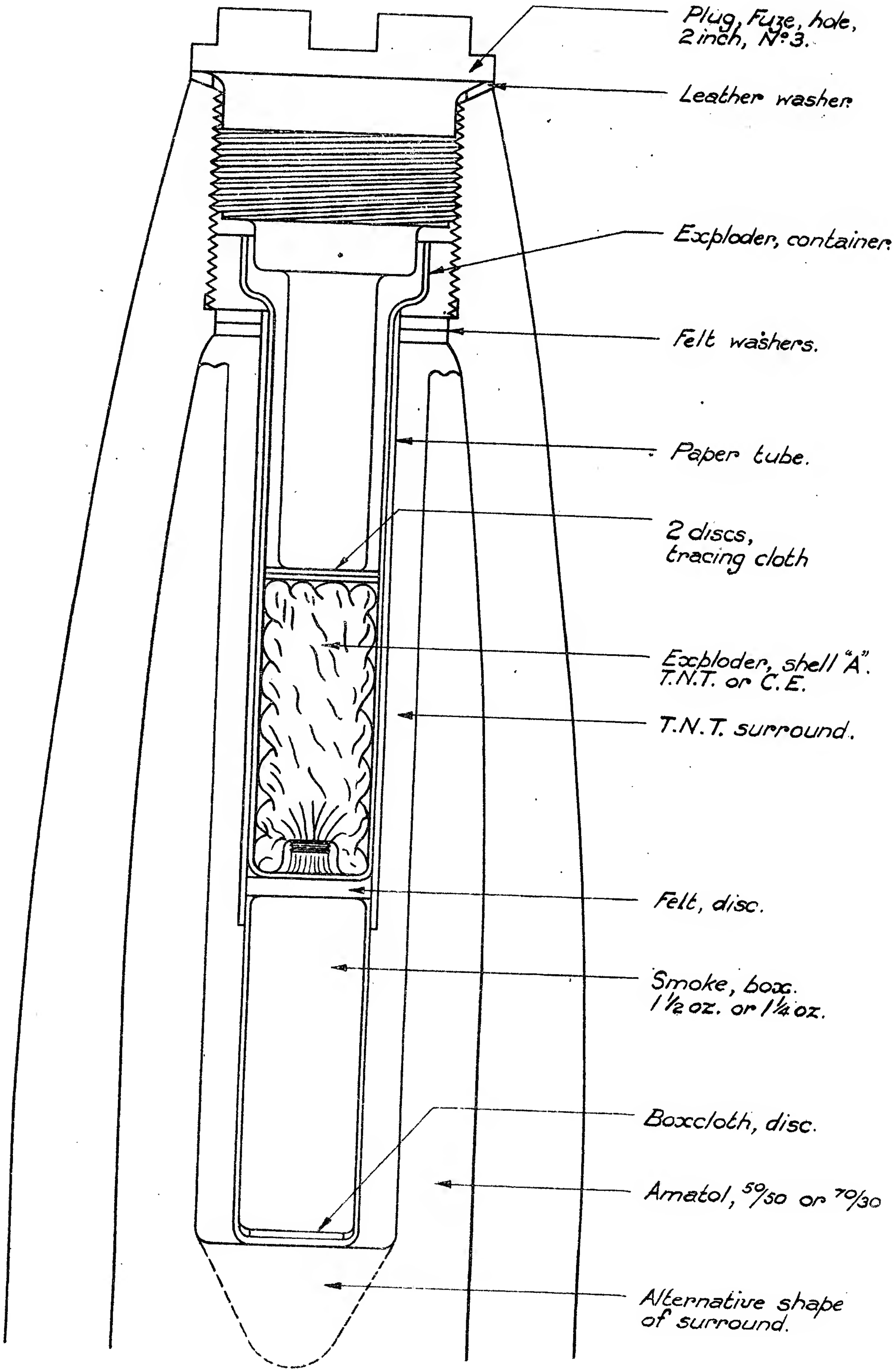


FIG. 84.

FUZES 159, 270, 346 & 480 (TYPICAL.)

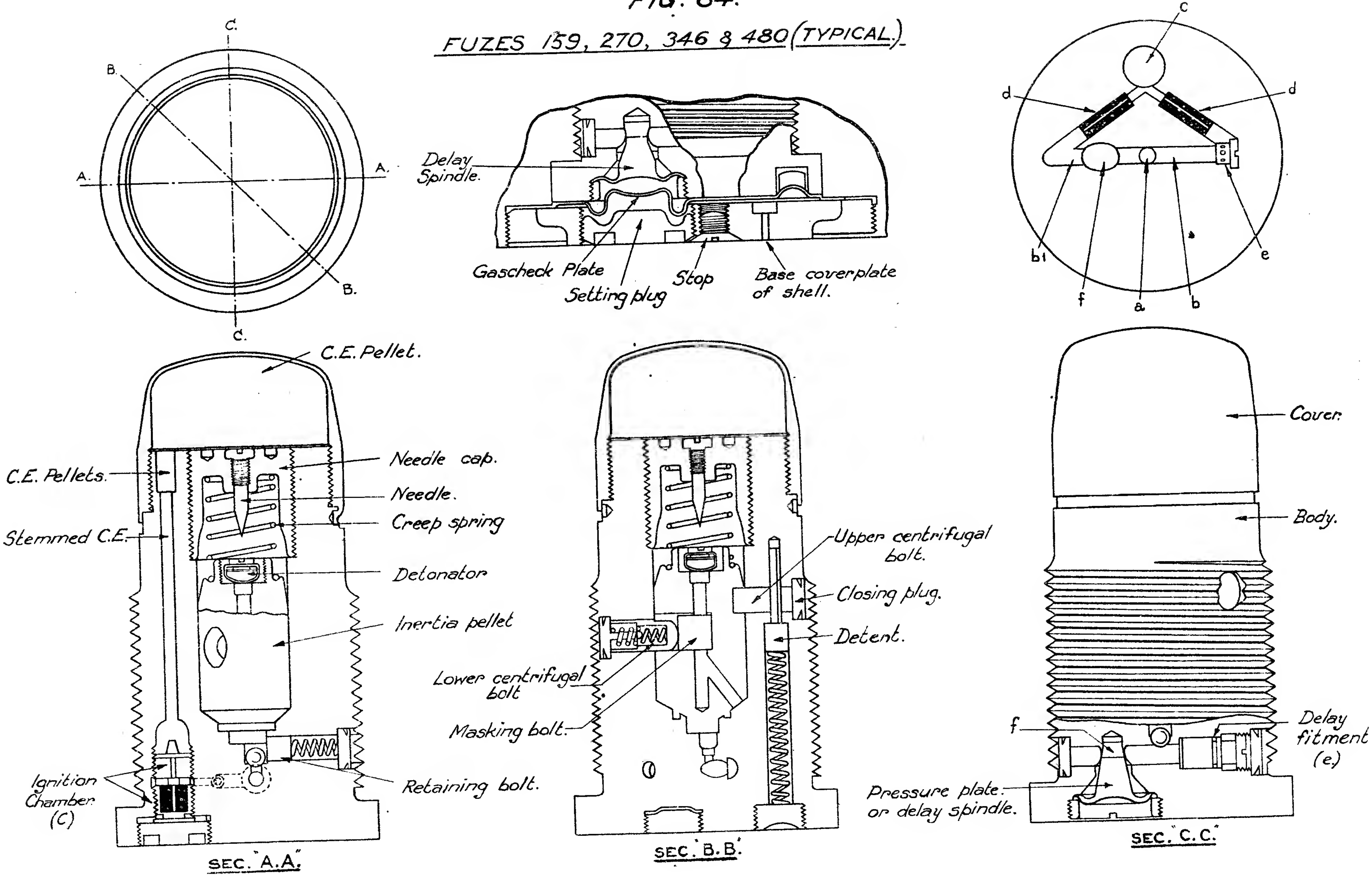


FIG. 85.

CARTRIDGE S.B. H.E. 3 INCH.

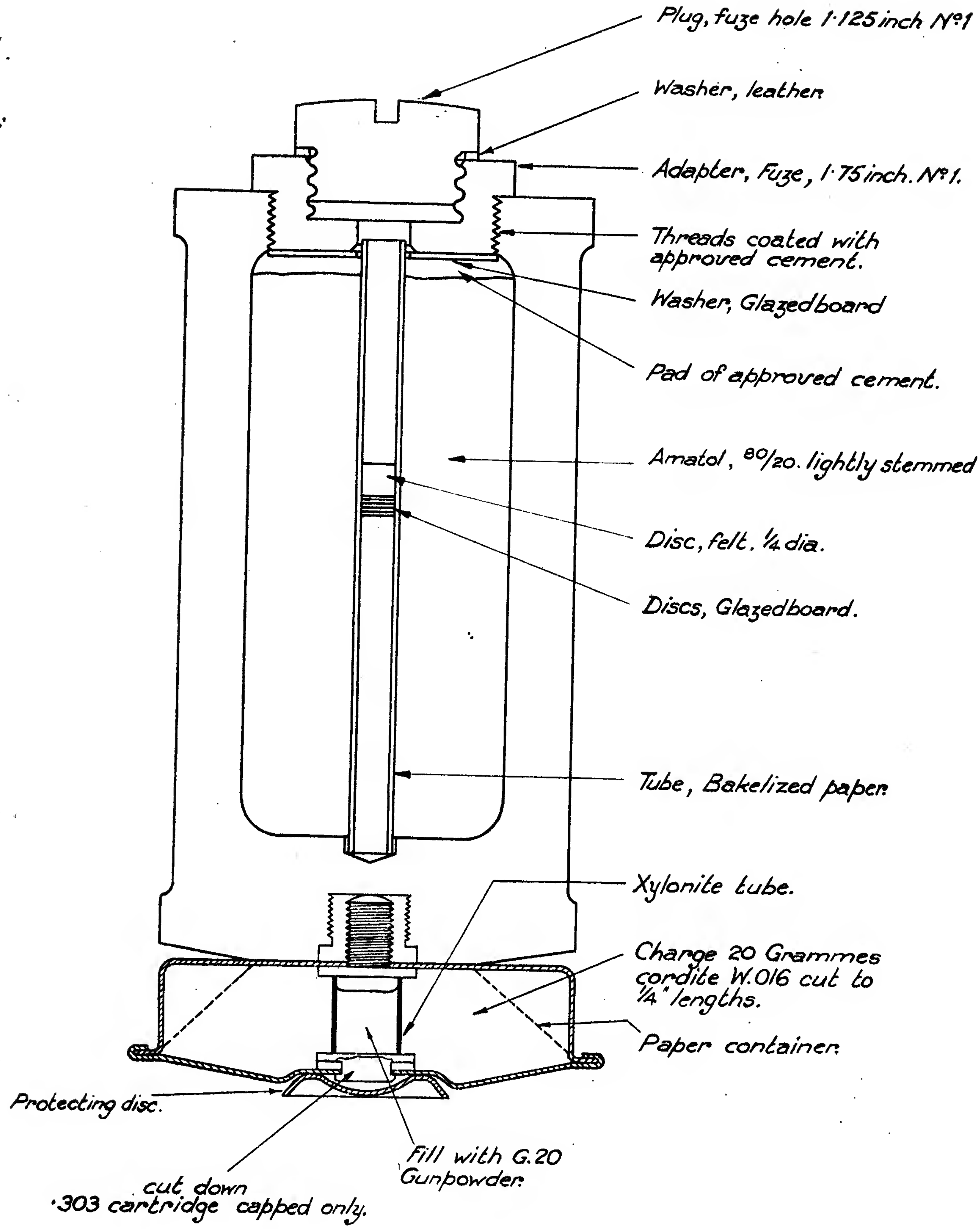


FIG. 86.

ROCKET U. 3 INCH.
TAIL PROPELLING.

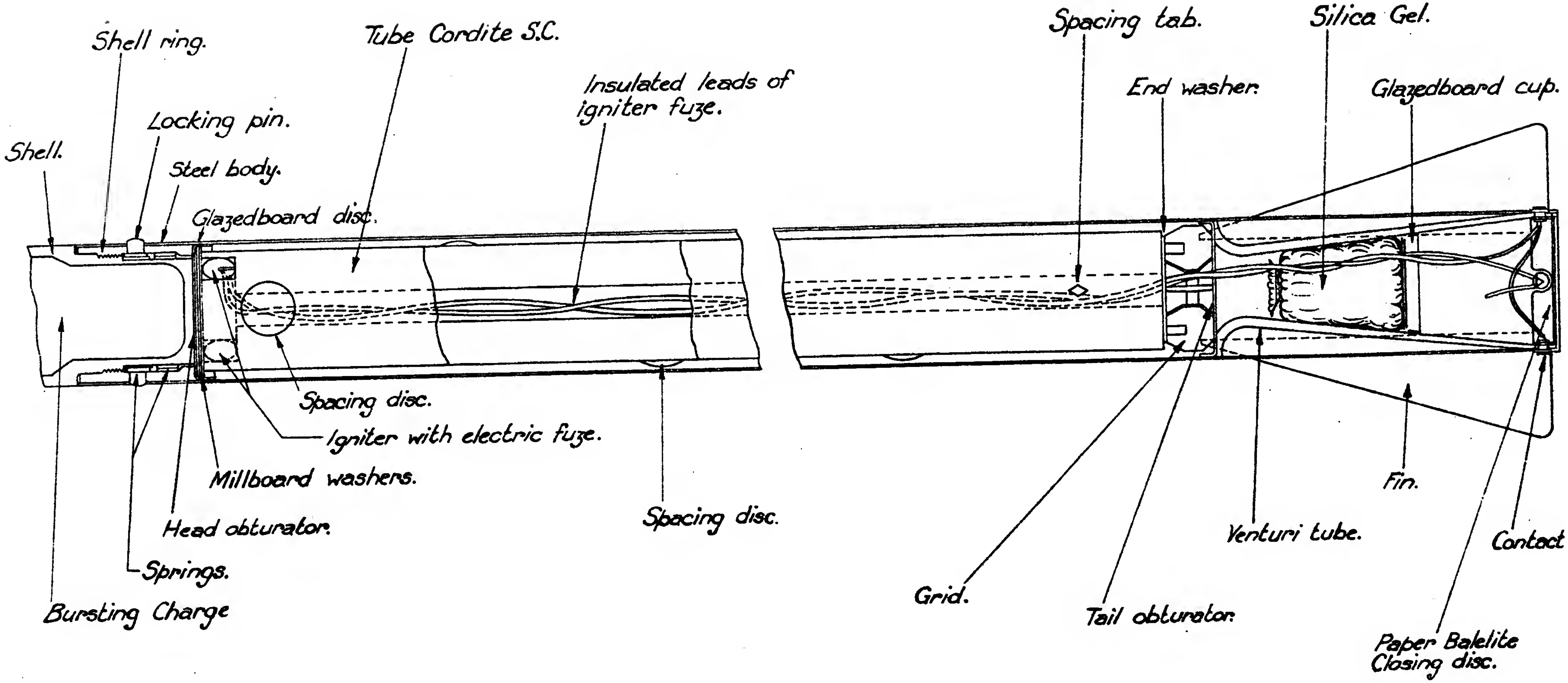
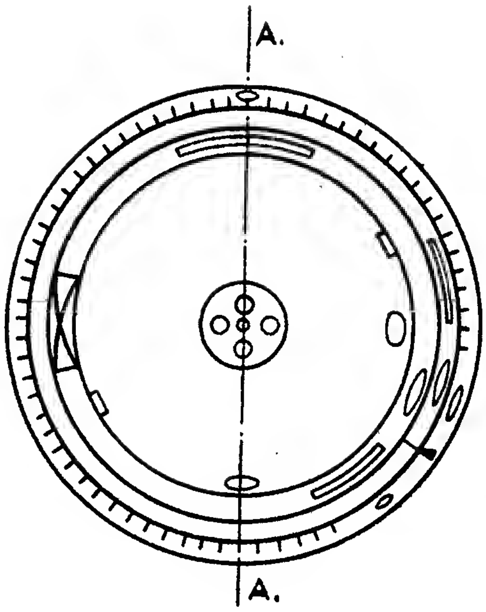
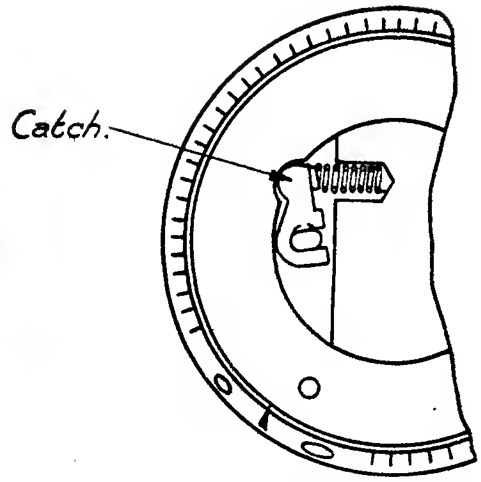


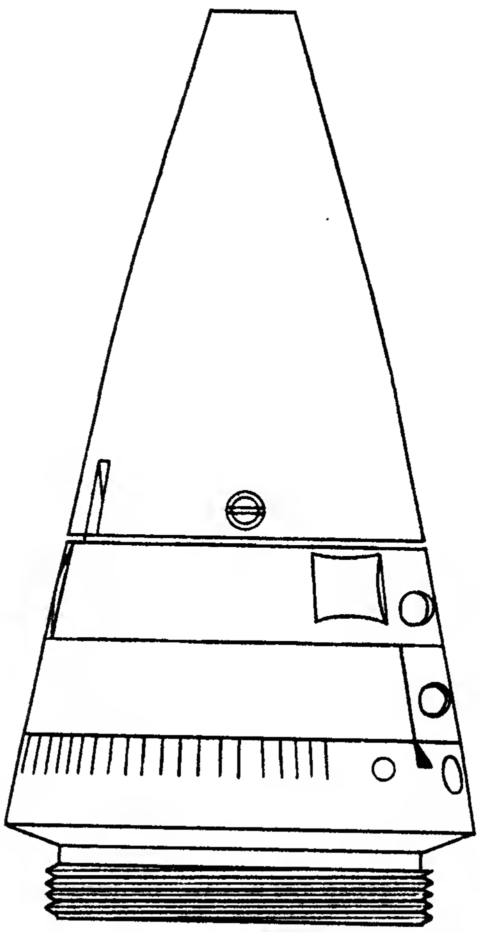
FIG. 87.

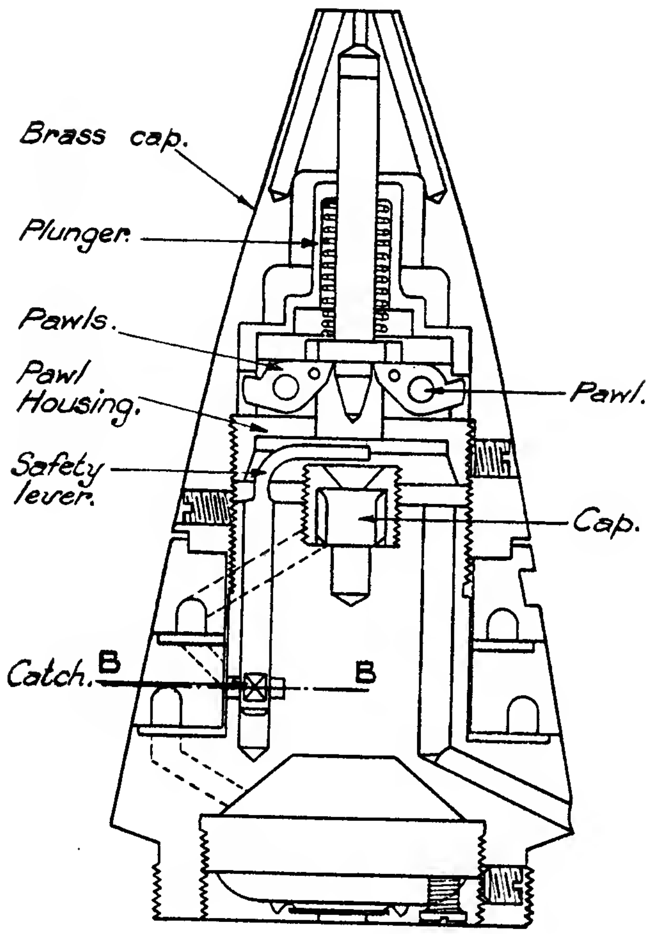
FUZE TIME No. 700.





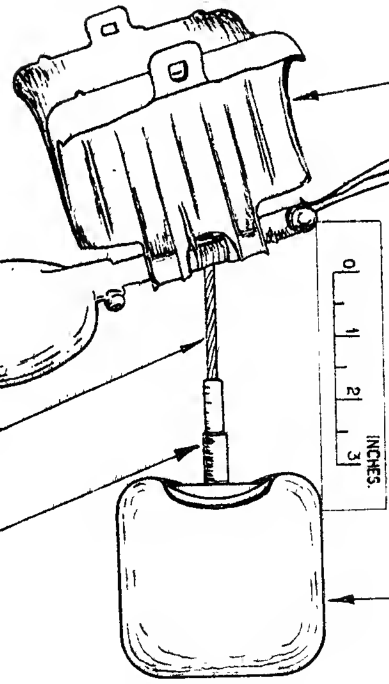
SECTION B.B.

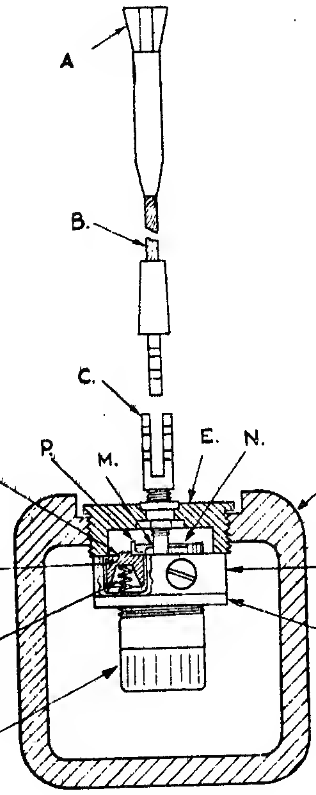




SECTION A.A.

FIG. 88.





GERMAN 2 K.G. (ANTI-PERSONNEL BOMB.)

FIG. 89.

FUZE FROM GERMAN 2 K.G. (ANTI-PERSONNEL BOMB.)

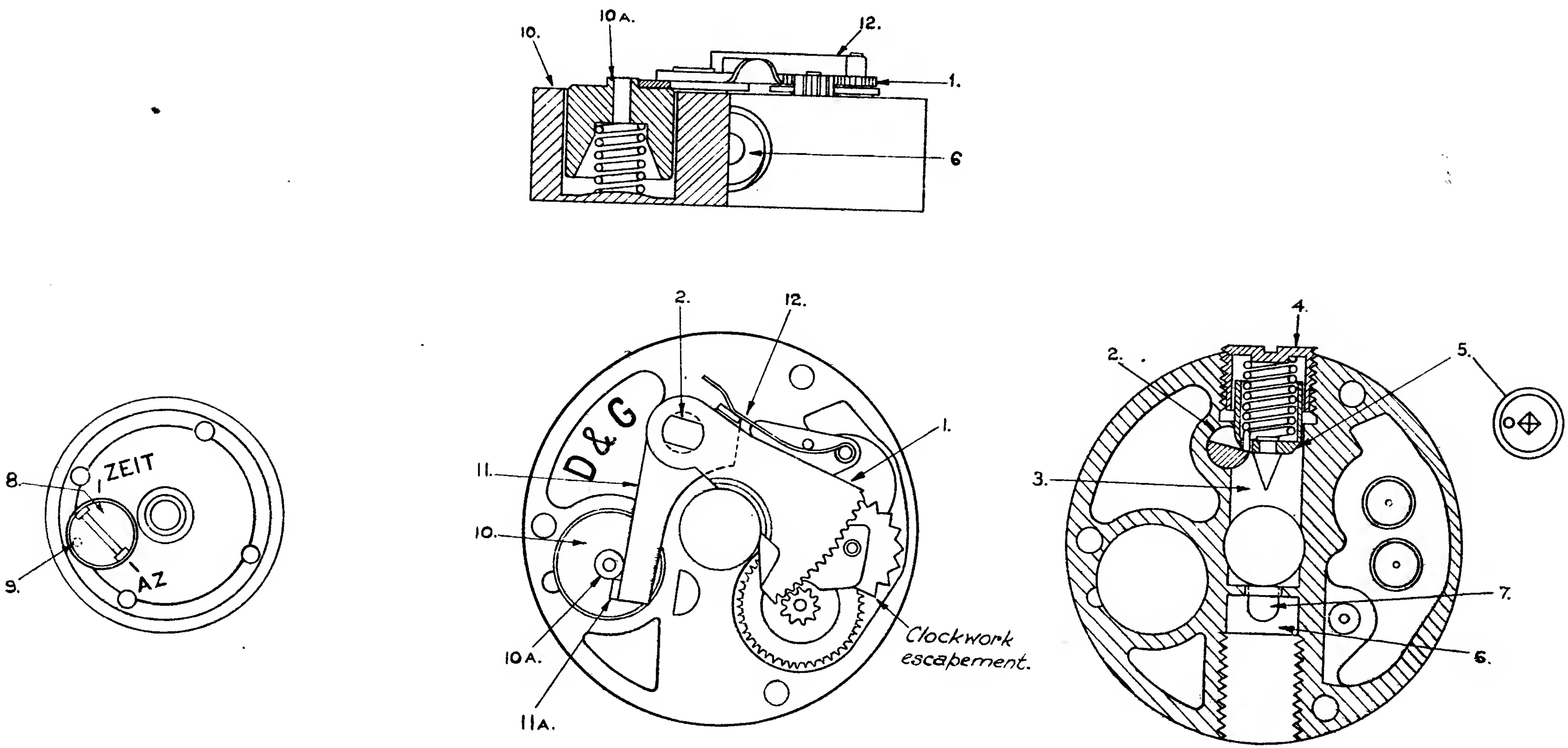


FIG. 90.

4·5 K.G. MANZOLINI H.E. BOMB.

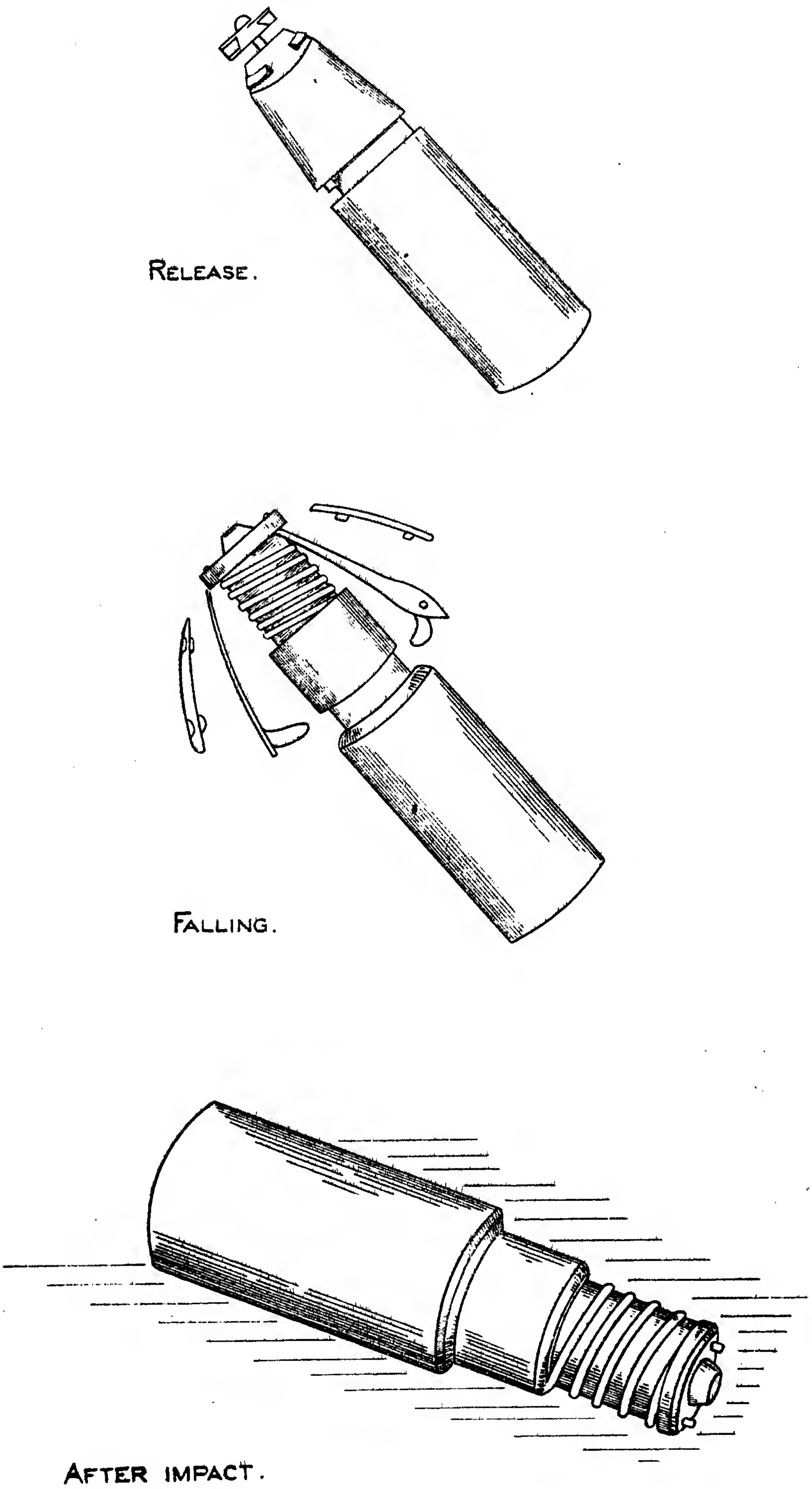


FIG. 91.

FUZE FOR 4·5 KG. MANZOLINI H.E. BOMB.

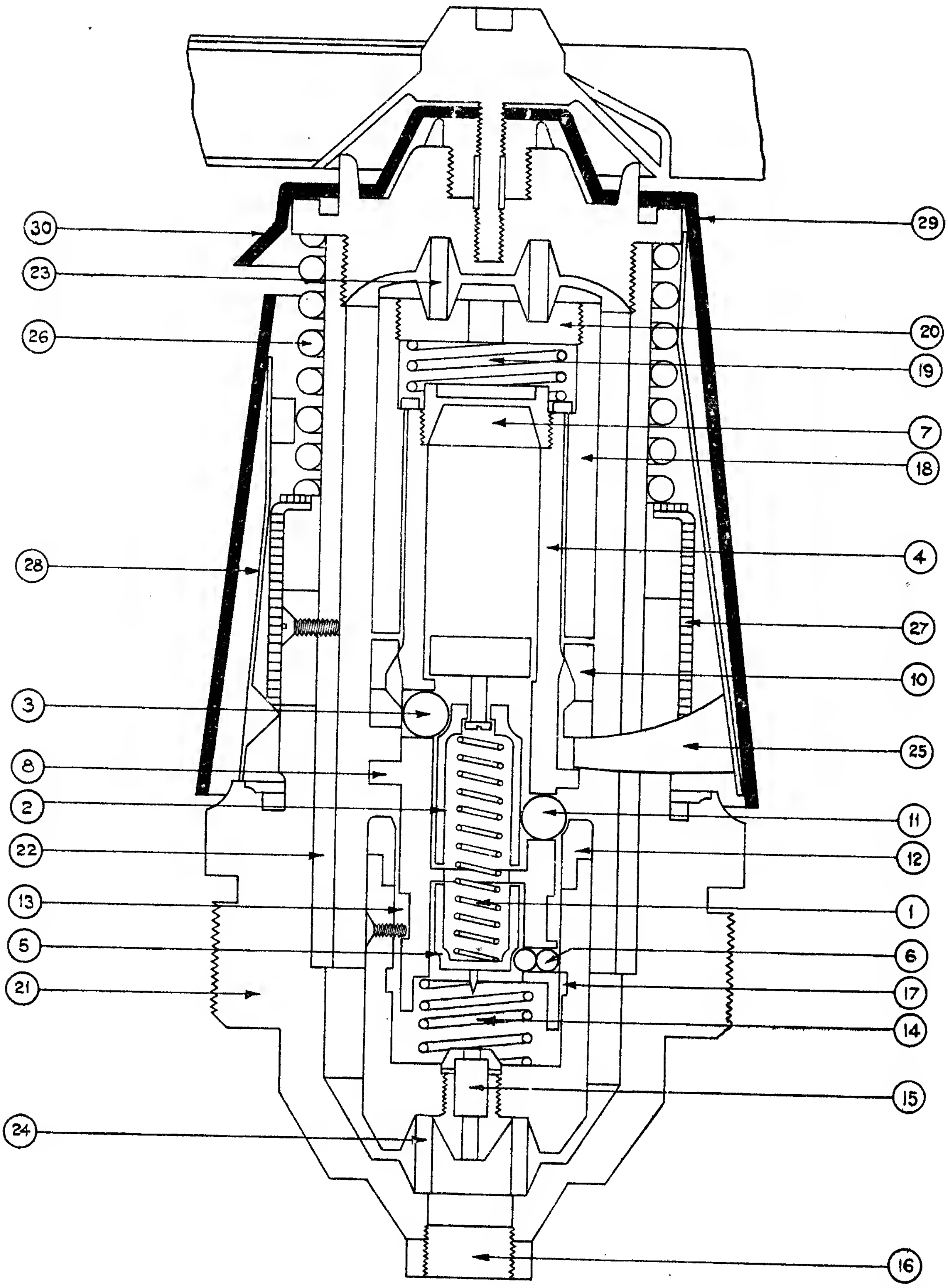
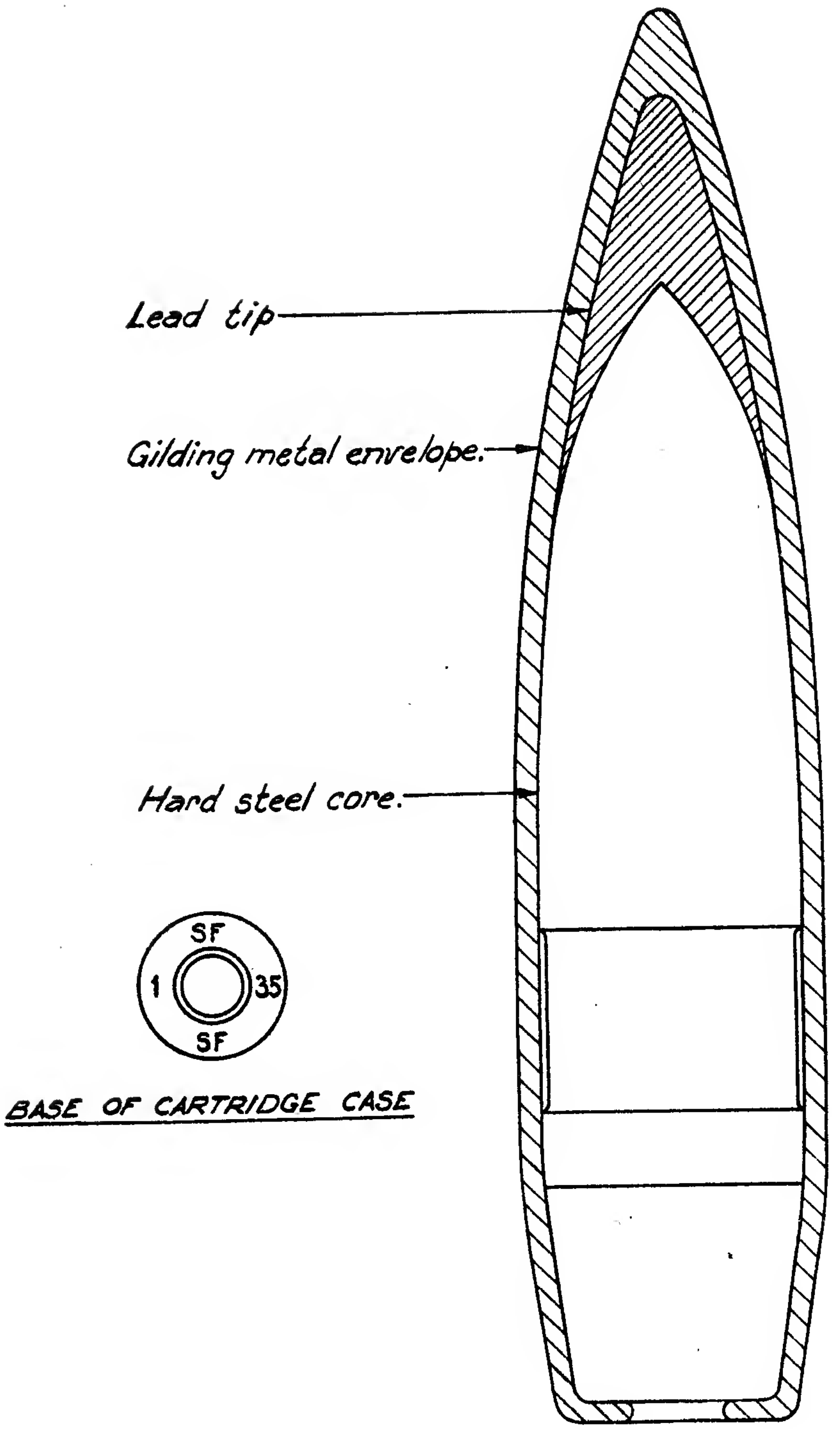
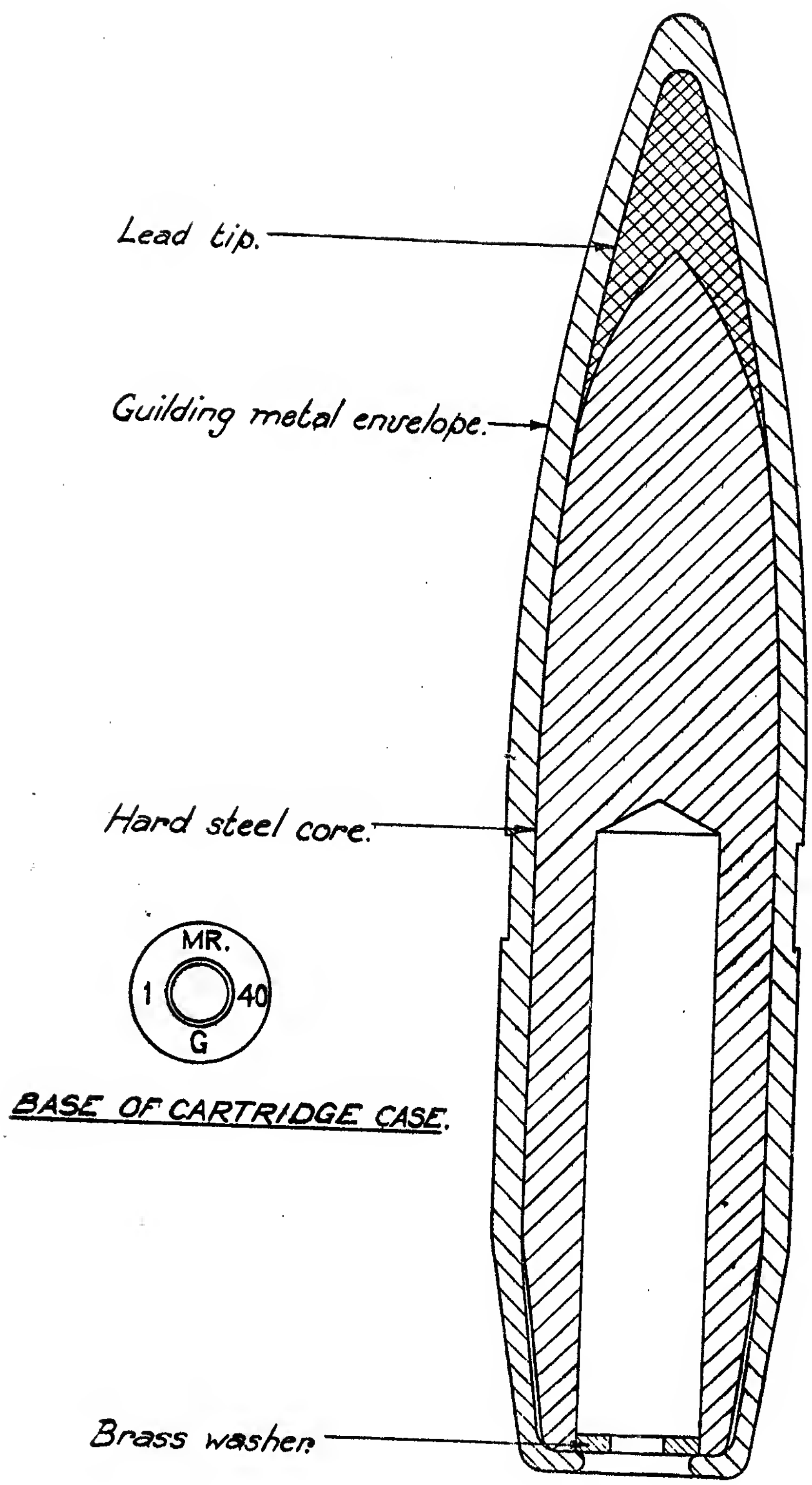


FIG. 92.



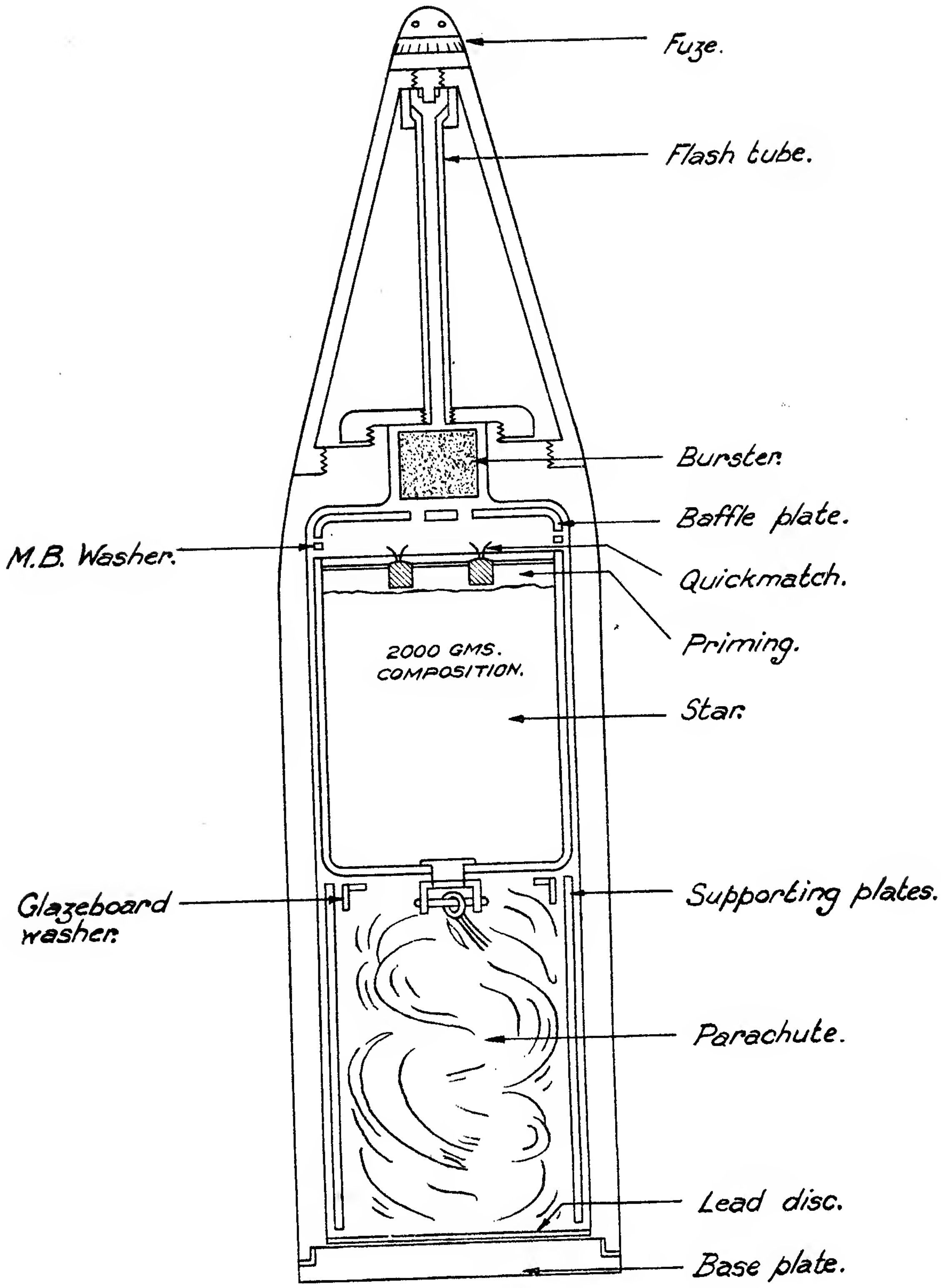
13·2 MM. A.P. (AMERICAN DESIGN.)

FIG. 93.



13·2 M.M. A.P.T. (AMERICAN DESIGN.)

FIG. 94.



FRENCH STAR SHELL 138 MMS.